

Impact of FY03 Budget on LBNL

**HEPAP Presentation
Jim Siegrist
April 26, 2002**

LBNL's Value to HEP



Highly leveraged infrastructure

- Outstanding faculty supported by UCB
- Small but dedicated full-time scientific staff
- Excellent technical resources (used only when needed)
 - Engineering Division (IC design)
 - Computing Division (NERSC)
 - Large machine shops, clean room facilities

Creativity and Innovation

Time Projection Chamber

SVX chip and first Si vertex detector in collider environment

Asymmetric B Factory concept

Smart pixels for ATLAS

CCDs for astronomy & astrophysics

SNe cosmology – dark energy

Synergy leads to creativity and innovation

Outline



- **Focus of recent LBNL contributions to HEP**
 - FNAL Run II detector upgrades
 - BaBar Computing
 - ATLAS pixels
 - LHC Accelerator research program
- **Base program budget**
 - Proposed FY03 budget will result in drastic cuts in our core program
- **SNAP**

LBL in CDF Run II Upgrade



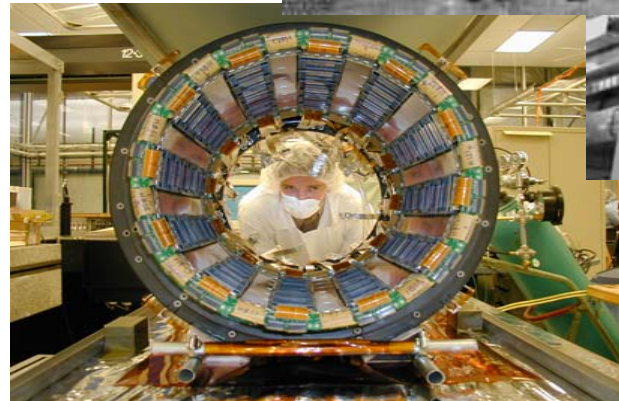
Leadership

- Commissioning Czaress (Czarina?) Young Kee Kim
- Offline Computing Head Marjorie Shapiro



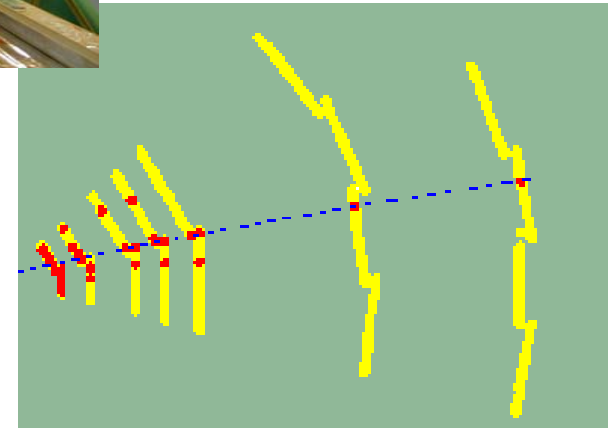
Hardware

- LBL led work on first CDF silicon vertex detector
- Design and testing of SVX II & III chips & hybrids
- Central Outer Tracker design and fab of COT field sheets



Software

- Silicon Tracking
- Simulation

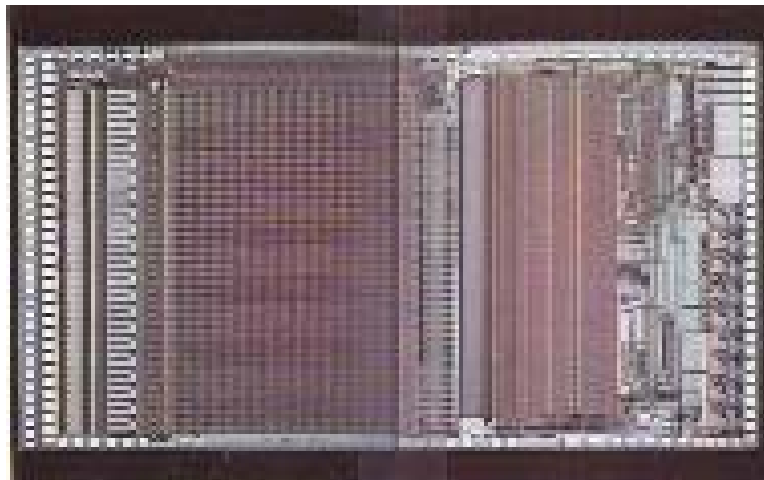


“The SVX chip will transform collider physics” – *John Peoples, circa 1992*



Run 2A

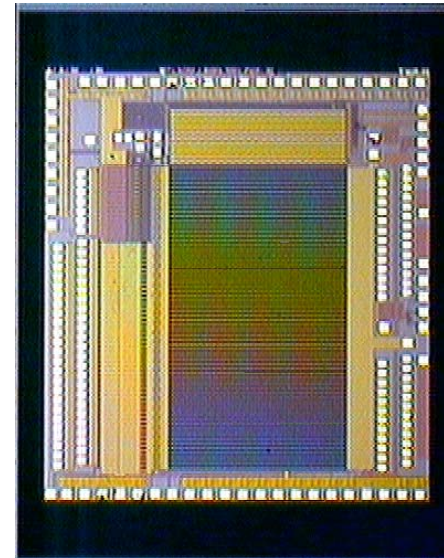
- SVX3 chip back-end (front end and integration at FNAL)
- Bench testing & irradiation of SVX3 prototypes
- Probing all SVX3 wafers
- Reprobing every individual chip



SVX3D

Run 2B

- Initiated conversion of SVX3 to 0.25 μm CMOS
- SVX4 chip back end (front end at FNAL) integration & full chip simulation
- Bench testing & irradiation of SVX4 prototypes



(test chip)
First full chip
run due
5/23/02

AFRD Will Assist FNAL with Support to Improve Luminosity of Run II



- Working with Mike Church (FNAL) to identify task areas for LBNL
- Preliminary identification of areas for optimal effectiveness
 - Design and fabrication of feedback and beam control systems
 - Accelerator physics studies - theoretical and computational
 - Design and fabrication of instrumentation
- Team will be on a fact-finding tour at FNAL May 6-9
 - Walter Barry, Glen Lambertson, Stefano DeSantis, John Corlett

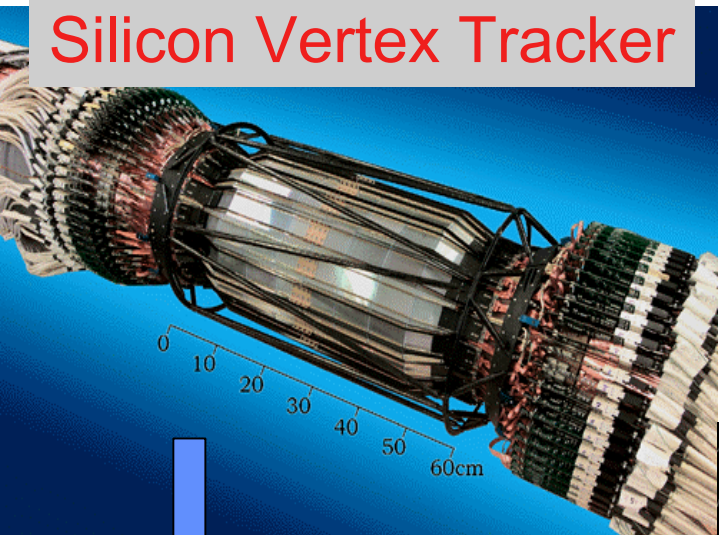
Proven Capabilities of AFRD

instrumentation
stochastic cooling
feedback systems
microwave and rf systems
impedance budget
collective effects studies
accelerator physics
commissioning

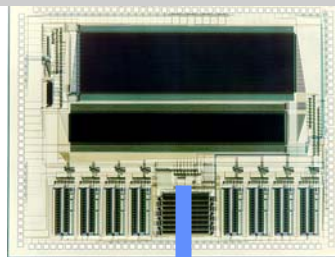
LBL's Contributions to BaBar



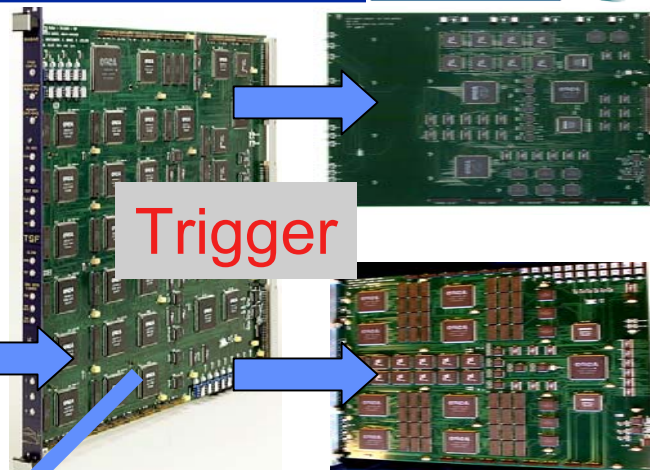
Silicon Vertex Tracker



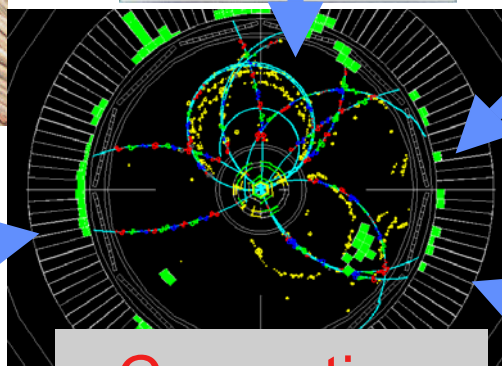
Drift Chamber
Readout IC



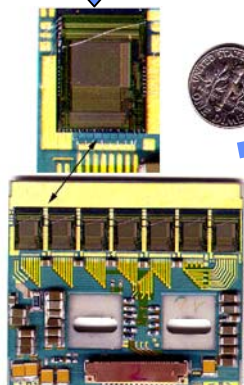
Trigger



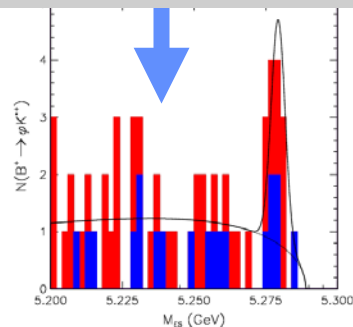
Computing



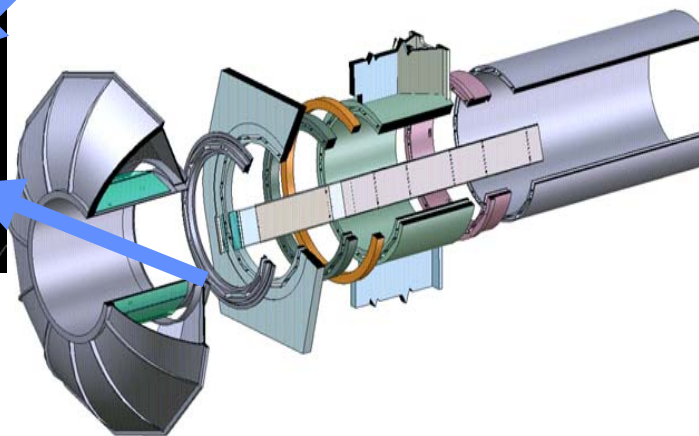
SVT
Readout IC



Physics
Analysis



DIRC Mechanics
and Online

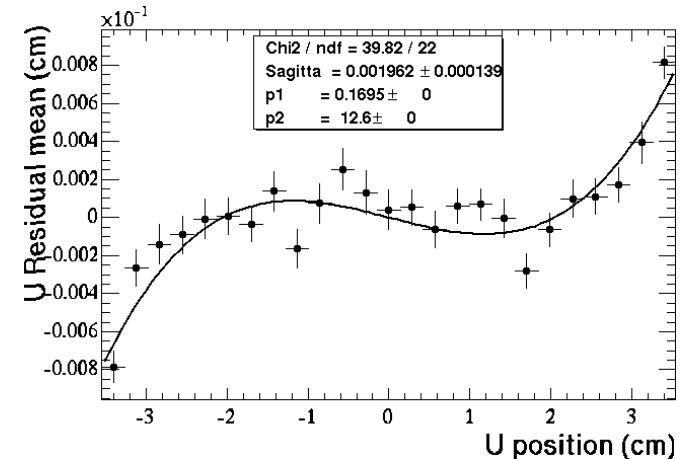


Recent Innovation: Data Format Upgrade

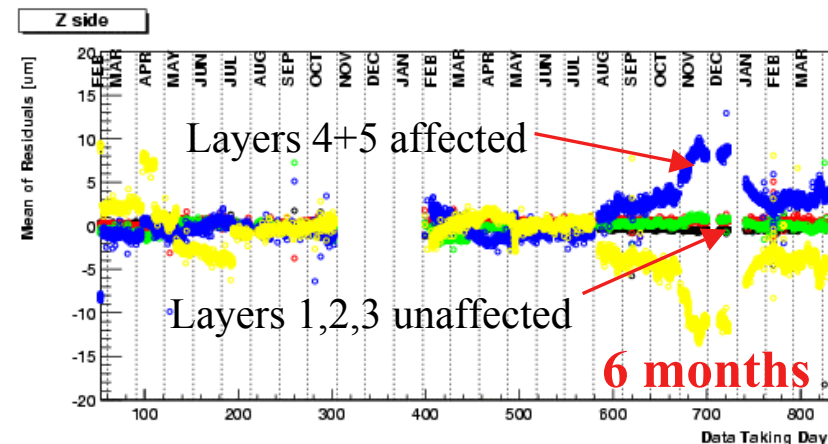


- “Mini-DST”:
 - Support precision detector alignments and calibrations
 - Follow changes in detector constants w/o reprocessing
 - Small enough to be stored on disk
- BaBar Computing Management Plan
 - “Expect (the Mini-DST) to replace (the Micro-DST) by 1st November 2002
- Conceived and executed by LBNL
 - Physics Division + Computing Sciences Division

20 micron bend across 7 cm Si wafer



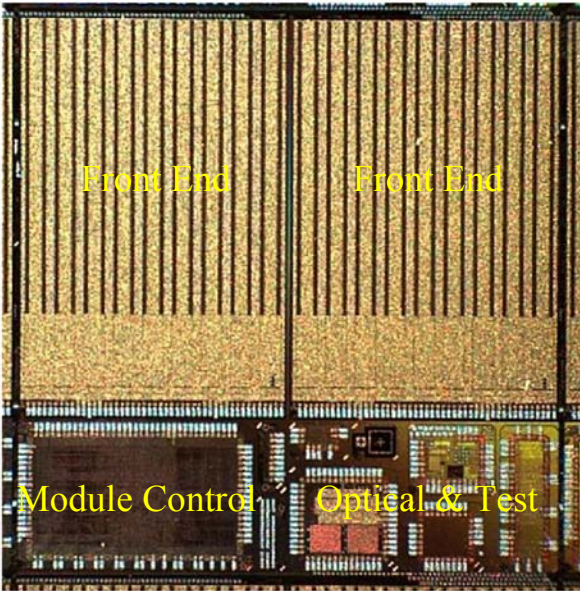
Time-dependent internal vertex misalignment: ~ 20 alignment sets needed!



Breakthrough in Pixel Electronics for ATLAS

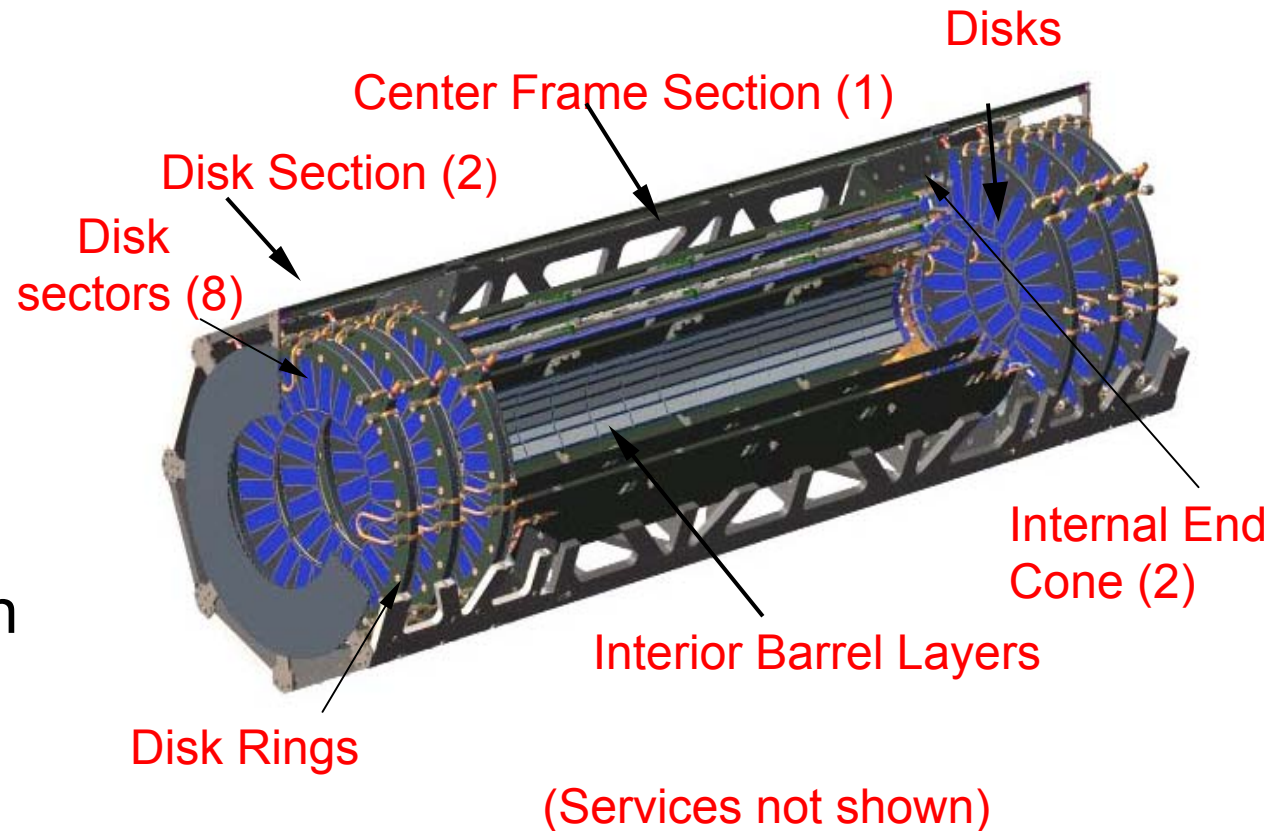


Pixel Integrated Circuits



Mechanical structure fabrication underway.

Rad-hard deep submicron circuits available since January. **THEY WORK!**



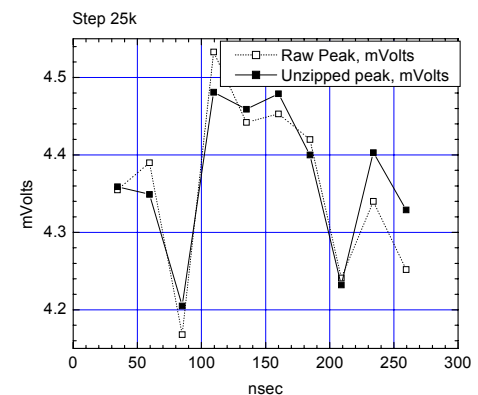
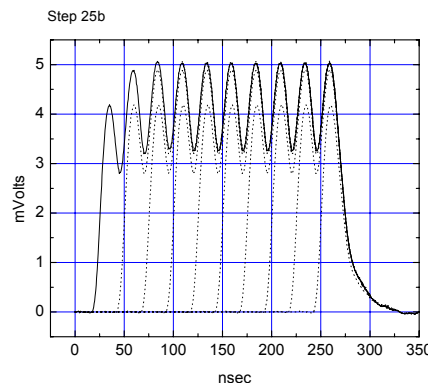
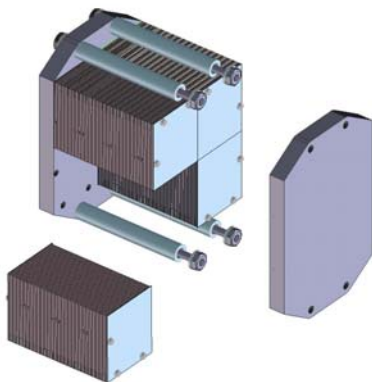
We must meet our commitments in ATLAS

US LHC Accelerator

brookhaven - fermilab - berkeley



- Overall LBNL work on the US LHC Project is ~65% complete and all tasks are either in or near start of fabrication and assembly
 - Design of LBNL's most complex task – IR Cryogenic Distribution Boxes – is complete, fabrication expected to start in May 2002
- LBNL is working with FNAL and BNL to plan the content of the new US LHC Accelerator Research Program
 - IR Absorbers supplied by LBNL as part of the US LHC Project will be instrumented for 40MHz luminosity optimization
 - Tests on SPS 450 GeV proton beam demonstrated 40MHz capability

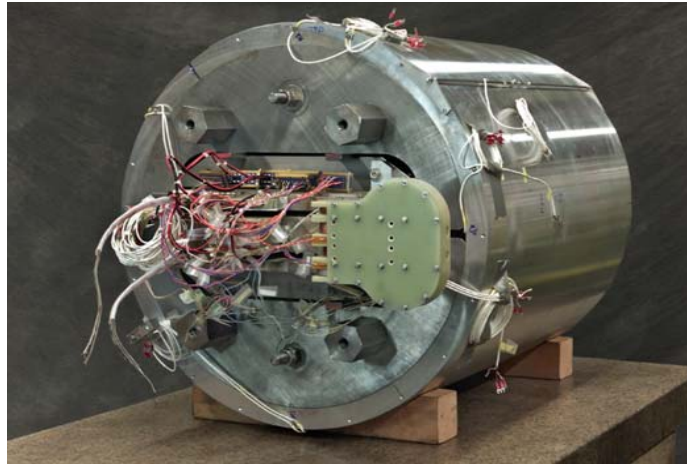


LBNL Superconducting Magnet Program

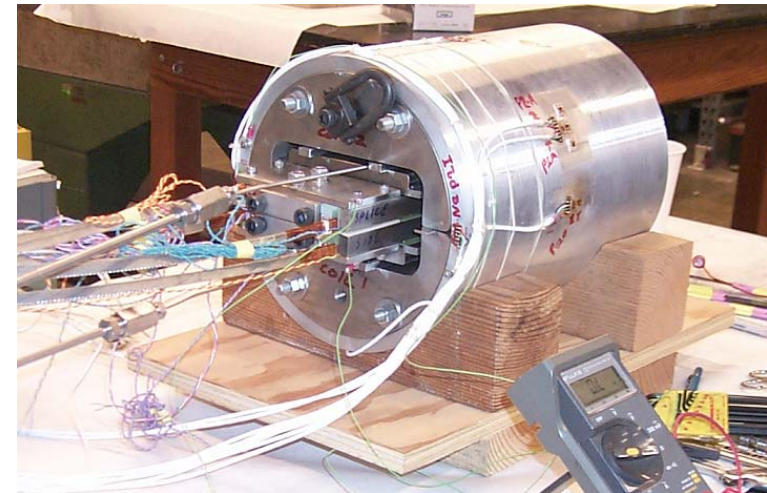


Recent success of the High Field Magnet Program at LBNL has established Nb₃Sn as the enabling technology for the next generation IR quadrupoles for the LHC

**World Record
Dipole Field
14.7 Tesla**



**Supported by DOE Office of Science, HEP Division,
Advanced Technology R&D Program**



**Sub-scale magnets
allow rapid prototyping
of new design options**

FY02 Physics Division Problem



- **FY02 funding is \$0.5M less than FY01**
- **At this stage we are \$1.1M short of closing the fiscal year**
- **Drastic reductions are underway**
 - Reduction in Force in progress
 - Hiring freeze
 - Curtail travel and purchases

The FY03 Problem



At current level of effort:

- **We are \$1M short in FY03 as in FY02**
- **We will have real inflation of \$1M**
- **We need \$1M to make up FY02 expenses postponed to FY03**

As a result:

- **We are short \$3M for FY03 in the base program**

Physics Division FY03 Program Cuts



80% of our costs are labor → cut program

—Physics Division in Reduction In Force (RIF) mode since April 3

—We will reduce permanent scientific staff by ~10%

—We will reduce postdocs over the next year ~15-20%

—More cuts needed to meet budget guidelines

Our ability to innovate will be gutted and our contributions to the field will be drastically cut on all fronts

AFRD Has a Similar Problem



- Budget ~ 1/3 of Physics Division, but share of the pain the same
- Reduction in staffing in all areas at **10-15%** by 2004

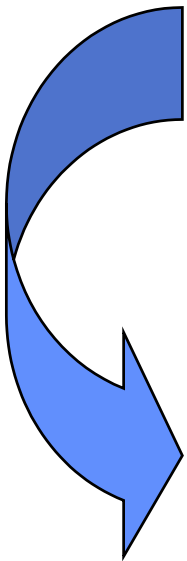
A major problem in meeting our commitments

The Entire Field is Suffering



How can we turn around the declining budgets?

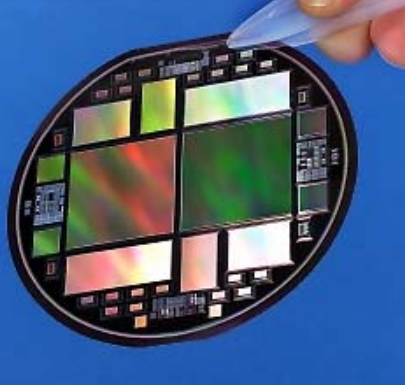
One answer – new initiatives with compelling science and significant connections outside the field.



NEW MONEY

- Long-range HEPAP Subpanel's first recommendation:
 - *We recommend that the United States take steps to remain a world leader in the vital and exciting field of particle physics, through a broad program of research focused on the frontiers of matter, energy, space and time.*
- Recent discoveries pioneered by LBNL and supported by DOE suggest that the universe is dominated by a mysterious "dark energy":
 - *"#1 on my list of things to figure out"-E. Witten*
 - *"the most fundamentally mysterious thing in basic science"- F. Wilczek*
 - A complete theory of the fundamental constituents of the Universe must explain this dark energy
- SNAP, the SuperNova Acceleration Probe, is designed to make precision measurements of the cosmological parameters, testing new theories of "dark energy"

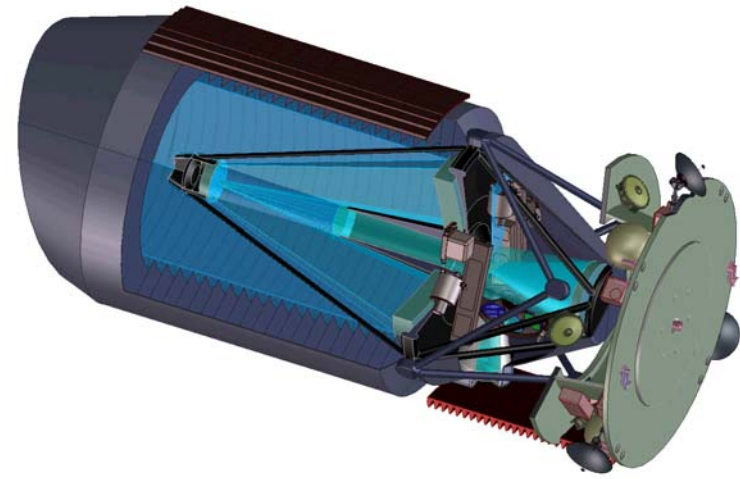
SNAP: An Example of LBNL Innovation at Work



- **CCD development – A new instrument for science**
 - Very heavy support from LBNL discretionary funds
 - New capability with broad potential impact outside HEP
- **Berkeley's Space Sciences LAB (SSL)**
 - Extensive experience in space missions
 - SSL & LBNL form engineering backbone for the team

FY03: CDØ, progress on open R&D issues, move toward conceptual design and costing in FY04.

Rapid progress requires the effort to ramp up.



NASA: Structure & Evolution of the Universe
Strategic Plan will be officially out this fall

- We expect Dark Energy will be a major element

National Academy (see Turner's talk tomorrow)
recommends:

“the Committee further recommends that NASA and DOE work together to construct a wide-field telescope in space to determine the expansion history of the Universe and fully probe the nature of Dark Energy”